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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/879,529	06/12/2001	Junya Shimizu	JP920000126US1	3180

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EXAMINER	
ROSARIO-VASQUEZ, DENNIS	

ART UNIT	PAPER NUMBER
2621	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/879,529	SHIMIZU ET AL.	
	Examiner	Art Unit	
	Dennis Rosario-Vasquez	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 June 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 June 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1,3,4,7,8 and 15-17,20,22,24,26,29 and 30 are rejected under 35 U.S.C. 102(b) as being anticipated by Miyake (US Patent 5,917,963 A).

Regarding claims 20-31, Miyake discloses software that can be used with a computer at col. 5, lines 30-33.

Regarding claims 1, 20 and 24 Miyake discloses an image transform method comprising:

transforming original input image data into image data expanded by a ratio represented by a rational number or an integer (Miyake uses nearest neighbor interpolation to enlarge an image twice the size of the original image at col. 2, lines 1-13.), including the steps of:

a) reducing correlation in the vertical and horizontal directions of an image that is linearly expanded in the vertical and horizontal directions to generate first expanded image data (figure 29 is the result of nearest neighbor interpolation of an input image figure 28. Figure 29 shows a strong correlation in the horizontal and vertical directions, that has a jagged appearance, as compared to figure 28 that has a weak correlation in the horizontal and vertical directions which results in a smoothed line. Figure 29 is used as input to figure 5, num. 100 that will be smoothed by num. 200 to reduce the jagged appearance at col. 8, lines 10-19 and 39-43.);

b) performing linear interpolation (fig. 5, num 103. Note that like numerals of figure 5 are identical to the corresponding numerals of figure 1 at col. 8, lines 26-28.), based on correlation with a target pixel constituting said original image data and neighboring pixels arranged in oblique directions (fig. 8, is a portion of a window with an original sampled center pixel of interest or target pixel (col. 5, lines 53-56) and oblique pixels labeled "MIN" and "MAX" that are used for interpolating the center pixel position as processed in figure 5, num. 103 and col. 9, lines 24-35.), using said neighboring pixels to generate second expanded image data (output of figure 3,num. 103); and

c) employing said first expanded image data and said second expanded image data to generate a final image (fig. 5 , num. 201). Miyake states,"...the present invention provides an image processing apparatus for converting inputted image data having low resolution to image data having high resolution and performing a process for increasing the number of pixels of the inputted image data...(col. 3, lines 43-47)."

Regarding claim 3, Miyake discloses the image transform method according to claim 1, wherein said step of generating said second expanded image data includes the steps of:

determining an interpolation direction (Using figure 27, Miyake uses bi-linear interpolation that shows an interpolated point E or target pixel with respect to 4 neighboring pixels that determine where the point should be located) based on values of differences between said target pixel and said neighboring pixels (Figure 27 includes a formula at the bottom which has a difference that determines interpolation point E.); and

performing linear interpolation in said interpolation direction.

Regarding claim 4, Miyake discloses the image transform method according to claim 1, further comprising the step of:

regarding, as an adjustment value, the personal preference of a user concerning image quality (Miyake states that the system of figure 5 can be modified with a look up table similar to the system of figure 1 (LUT at figure 1, num. 107) that can be experimentally calculated to attain optimum results at col. 7, lines 15-17.),

wherein, at said step of generating said final image, based on said adjustment value, said final image is generated by using said first and said second expanded image data (Using figure 5, the first image (output of 200) and the second image (output of 103) data are used as input data for the LUT of the modified system of figure 5.)

Regarding claims 7,22 and 26, Miyake discloses an image transform method comprising:

transforming original input image data into image data expanded by a ratio represented by a rational number or an integer (Addressed in claim 1), including the steps of:

reading a target pixel and neighboring pixels thereof in original image data (Addressed in claim 1);

employing said target pixel and said neighboring pixels to calculate directional differences (This element was addressed in claim 3) for the right oblique (Pixels B and D of figure 27) and the left oblique (Pixels A and C of figure 27) directions. Furthermore, fig. 2 shows a pixel-block of interest inserted between points "MAX" and "MIN" to interpolate an edge (fig. 4, num. 501) within the pixel-block of interest. The oblique lines shown between the dots are a result of bi-linear interpolation which interpolates in a directions corresponding to the dots of fig. 2.)

employing said directional differences to determine a strong correlated direction (The use of the formula of figure 27 has "INTERPOLATING POINT E" as the strong correlated direction.);

and

performing linear interpolation for said target pixel using said neighboring pixels arranged in said strong correlated direction (addressed in claim 7).

Claim 8 is similar to and addressed in claim 7 except for requiring a predetermined mask range. Miyake uses a variable mask (col. 7, lines 61-63) for figures 1 and 5 which contain like components (claim 1). Therefore the variable mask can change in size which allows neighboring pixels adjacent to the pixel of interest to be contained within the variable mask.

Claim 15 has been addressed in claim 7 except for requiring that a combination of the linear interpolation unit (Miyake, fig. 5, num. 103) and reduction processing unit (Miyake, fig. 5, num. 200). Miyake combines both units in series or pipeline fashion.

Claim 16 is similar to and addressed in claims 7 and 15.

Claim 17 has been addressed in claim 8.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 2,5,21 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyake (US Patent 5,917,963) and in view of Miyake (US Patent 5,917,963).

Regarding claim 2, Miyake discloses the image transform method according to claim 1, wherein said step of generating said first expanded image data includes the

steps of:

raster-scanning a window having a predetermined size wherein a target pixel and its neighboring pixels in the linearly expanded image data are included (Miyake uses a window that is generated at fig. 5, num 101 and surrounds a pixel of interest based on several lines of inputted data (col. 8, lines 31-34).

Miyake does not teach a rank order processing in the window. Instead a low pass filter (LPF at fig. 5, num. 200) is used to reduce correlation in the horizontal and vertical directions (jaggies). However, Miyake does state that the LPF can be replaced with another filter at col. 8, lines 39-43.

On the other hand, Miyake does teach a use of a rank order filter that uses maximum and minimum values in a window to create a median value at col. 8, lines 34-38.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to replace the LPF of figure 5, num. 200 of Miyake with the median value teaching of Miyake, because the use of a median value enables the formation of a shaper edge from col. 6, line 50 to col. 7, line 5.

Claims 5, 21, and 25 are similar to and addressed in claims 1 and 2.

6. Claims 10-12 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyake (US Patent 5,917,963) and in view of DeMond et al. (US Patent 5,079,544 A).

Regarding claims 10 and 28, Miyake teaches an image processing apparatus comprising:

vertical and horizontal directional correlation reduction means (fig. 5, num. 200) for reducing correlation of the obtained image in the vertical and horizontal directions (Addressed in claim 1);

oblique direction detection means (fig. 2 is a portion of a window) for detecting an oblique direction having a strong correlation with a target pixel and neighboring pixels in said original image data (Addressed in claim 7 above);

and

directional interpolation means (fig. 5, num. 103) for employing said neighboring pixels in said detected oblique direction to perform interpolation in said oblique direction (Addressed in claim 8).

Miyake does not teach a means for the remaining portion of claim 10. Miyake does suggest using and problems that arise from using nearest neighbor interpolation to interpolate in the horizontal and vertical directions from col. 1, line 19 to col. 2, line 59.

However, DeMond et al. does teach the remaining portion of claim 10 of:

input means for entering original image data to be expanded (DeMond et al., fig. 3, num. 140:"SIGNAL SOURCE");

vertical and horizontal directional interpolation means for interpolating said original image data in the vertical and horizontal directions (DeMond et al. ,fig. 3, num. 154:"CPU". The vertical and horizontal interpolation means or CPU 154 uses an "algorithm to interpolate...pixels in both the horizontal and vertical directions...(De Mond, col. 11, lines 30-36).")

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the teachings of Miyake of nearest neighbor interpolation with the CPU system of DeMond to provide a means for an input means and an interpolation means of Miyake's system, because Demond's CPU system provides "Additional and/or alternate processing, including other algoritms than the nearest-neighbor algorithm presently preferred, may be used. This serves to smooth the image and to increase apparent resolution (DeMond, col. 11, lines 39-43).

Regarding claim 11, Miyake teaches the image processing apparatus according to claim l0 further comprising:

generation means (Fig. 5, num. 201) for generating expanded image data based on an image obtained by said vertical and horizontal directional correlation reduction means (fig. 5, num. 200) and an image obtained by said oblique directional interpolation means (fig. 5, num. 200) (All the elements of claim 11 have been addressed in claim 1).

Regarding 12, Miyake teaches the image processing apparatus according to claim 11, further comprising:

input means (fig. 1, num. 107 can be used with the system of figure 5) for entering, as an adjustment value, the personal preference of a user concerning image quality (This portion of claim 12 was addressed in claim 4), wherein said generation means employs said adjustment value to synthesize said image obtained by said vertical and horizontal directional correlation reduction means with said image obtained by said oblique directional interpolation means.

Claim 14 is similar to and addressed in claim 7.

7. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyake (US Patent 5,917,963) and in view of Demond et al. (US Patent 5,079,544 A) and further in view of the combination of Miyake (US Patent 5,917,963) and in view of Miyake (US Patent 5,917,963).

Claim 13 is similar to and addressed in claim 2.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the combination of Miyake and DeMond as applied to claim 10 with the teachings of the combination Miyake and Miyake as applied to claim 2 for the same reason as claim 2.

8. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyake (US Patent 5,917,963 A) and in view of Choi (US Patent 6,658,165 B1).

Regarding claim 6, Miyake teaches the image transform method according to claim 5, further comprising the steps of:

determining, for said expanded image, whether the contrast in said original image data can be maintained at a predetermined level (Miyake can control the degree of sharpness of an edge, where contrast is large, by using predetermined values from a LUT at col. 7, lines 6-17 and "predetermined" at col. 6, lines 17-22.) Note that the use of the LUT with contrast method of figure 1 can be used with the method of figure 5 at col. 10, lines 7-17. ;

Choi, in the filed of endeavor of contrast enhancement, teaches the remaining portion of claim 6 of:

extracting a high frequency component (Choi, fig. 2, label "Yhpf1" is a high frequency component from a high pass filter) from an image (Choi, fig. 2, label "Yin"), and adding said frequency component (Choi, fig. 2, num. 180) multiplied by a constant (Choi, fig. 2, label "b") to said image (The high and low frequency components of the original image are initially separated then recombined with constants in adder 180 of fig. 2).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Miyake's teaching of using a LUT with contrast to control or maintain contrast with Choi's system of contrast enhancement, because Choi's system can enable a user to enhance or adjust each high and low frequency contrast components at col. 3, lines 33-37.

9. Claims 9,18,23,27 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Miyake (US Patent 5,917,963 A) and in view of Tateishi et al. (JP 401089759 A).

Claim 9 is similar to and addressed in claim 1 by Miyake except for requiring a bulging shape.

However, Tateishi et al. does teach a method of preventing a bulging shape or "swell" during interpolation in the abstract.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the system of Miyake with the teachings of Tateishi et al., because Tateishi et al.'s teaching "obtains a picture closer to its original picture and with high smoothness without any swell (Tateishi et al., abstract)."

Claim 18 is similar to and addressed in claims 1,9 and 15 except for color image data as additionally taught by Miyake at "natural...image is readily generated when handling a natural image" at (Miyake, col. 3, lines 41,42).

10. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyake (US Patent 5,917,963 A) and in view of Tateishi et al. (JP 401089759 A) and further in view of LoCicero et al. (US Patent 4,564,857 A).

Regarding claim 19, the combination of Miyake and Tateishi et al. does not teach anti-aliasing. Miyake does suggest removing components from an original image at Miyake, col. 2, line 61,62. Implicitly, Miyake does perform the second expansion with anti-aliasing as described in claim 19.

However, LoCicero, in the field of endeavor of television resolution, does teach anti-aliasing ("Vertical filtering of the...source signal...reduces the affects of aliasing" at LoCicero, col. 6, lines 45-47.) in original color image (LoCicero, "R,G,B" from a camera of figure 10, num. 1001) data includes thin lines(LoCicero teaches that the "camera 1001 is capable of functioning as a...line source of...[RGB] signals (col.6, lines 33-35).").

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the teachings of Miyake's teaching of removing components from an original image with the teaching of LoCicero's anti-aliasing, because LoCicero's pre-filtering to reduce anti-aliasing at an encoder (LoCicero, fig. 10, num. 1002) ensures proper samples are provided for a later interpolation during decoding (LoCicero, fig. 11, num. 1352) by removing frequency components above the Nyquist rate.

As a result of using LoCicero's system, anti-aliasing components are eliminated before being interpolated. Therefore, LoCicero's system with the combination of Miyake and Tateishi implicity interpolate data that has been pre-filtered for anti-aliasing within LoCicero's system.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kishimoto (US Patent 6,339,479 B1) is pertinent as teaching a method of using a directional interpolation filter with oblique points (fig. 8).

Miyake (US Patent 6,157,749 A) is pertinent as teaching a method of preventing jaggy images due to interpolation.

Yamashita et al. (US Patent 5,513,281) is pertinent as teaching a method of determining an interpolation direction (fig. 5).

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dennis Rosario-Vasquez whose telephone number is 703-305-5431. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Boudreau can be reached on 703-305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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